

NON-PUBLIC?: N
ACCESSION #: 8808030045
LICENSEE EVENT REPORT
LER)

FACILITY NAME: Byron, Unit 2 PAGE: 1 of 5

DOCKET NUMBER: 05000455

TITLE: Main Feedwater Pump Trip Due to Improper Isolation of Electrohydraulic
Control Fluid Supply Resulting in Reactor Trip

EVENT DATE: 05/06/88 LER #: 88-004-01 REPORT DATE: 07/22/88

OPERATING MODE: 1 POWER LEVEL: 094

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: M. Snow, Regulatory Assurance Supervisor

TELEPHONE #: 815-234-5440 Ext. 2280

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On April 27, 1988, an out-of-service condition on the 2C Main Feedwater Pump (MFP) was temporarily lifted to permit operation of the MFP, and the pump was started and placed in service. On May 6 a licensed reactor operator (NSO) noted that the temporary lift was due to expire on that day and requested a disposition from a licensed senior reactor operator (SCRE). The SCRE directed the NSO to terminate the temporary lift by returning the equipment to its original out-of-service condition. Both the SCRE and the NSO incorrectly believed that returning the valve listed on the temporary lift paperwork to its out-of-service closed position would not affect the operation of the 2C MFP. At 1214 on May 6 with Unit 2 at 94 percent power an Equipment Operator closed the valve, which isolated electrohydraulic (EH) fluid supply to the 2C MFP. At 1215 the 2C MFP tripped due to low EH fluid pressure. Steam generator levels lowered rapidly and the NSO manually tripped the reactor in anticipation of an automatic trip. Operator actions taken following the reactor trip were correct, and stable plant conditions were achieved in Hot Standby at 1330.

Several causes contributed to the improper closure of the EH valve. The NSO and the SCRE committed cognitive personnel errors by failing to recognize the consequences of the return to out-of-service condition. Both individuals made incorrect assumptions regarding system design without reference to

system drawings. The administrative procedure for control of temporary lifts contributed to the personnel errors.

The Operating Department personnel involved in the event have been interviewed and specific performance weaknesses have been discussed. Administrative procedures will be revised appropriately to minimize recurrence.

There have been no previous similar occurrences of this event.

(End of Abstract)

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Energy Industry Identification System (EIIS) codes are identified in the text as (xx)

A. PLANT CONDITIONS PRIOR TO EVENT:

Event Date/Time 5/6/88 / 1216

Unit 2 MODE 1 - Power Operation Rx Power 94%
RCS (AB) Temperature/Pressure Normal Operating

B. DESCRIPTION OF EVENT:

On April 9, 1988, at 1152 the 2C turbine driven Main Feedwater Pump (MFP) (SJ) was removed from service in order to replace the servo valve on the Low Pressure Governor Valve (2EH-5049B). The position of 2EH-5049B had been oscillating abnormally, and its servo valve was believed to be the cause. Establishment of the maintenance out-of-service boundary was accomplished by closing the Electrohydraulic Control Fluid Supply Valve (2EH-5058B) (JJ). The servo valve was replaced but could not be tested to verify satisfactory operation because the internal components of 2EH-5049B had been damaged during the valve's oscillations. Therefore, the out-of-service condition could not be administratively cleared by completing the required valve testing. Complete repair of 2EH-5049B will require that the main condenser be at atmospheric pressure.

Due to feedwater piping vibration and flow control problems associated with the operation of the 2A motor driven MFP, the starting of the 2C turbine driven MFP was pursued. At 1730 on April 27, a Temporary Lift on the out-of-service was authorized by the Unit 2 Shift Foreman (licensed Senior Reactor Operator) to permit operation of the 2C MFP using steam supplied from the main steam header (SB) via the High Pressure Governor Valve. Valve 2EH-5058B was opened and the 2C MFP was started and aligned

to supply feedwater to the steam generators. The 2A motor driven MFP, which had been supplying feedwater, was stopped. The 2B turbine driven MFP continued to operate with steam supplied to its turbine from a Moisture Separator Reheater via its Low Pressure Governor Valve, which is the normal steam supply for the MFP turbines at high power levels.

On May 6, 1988, a Unit 2 licensed reactor operator Nuclear Station Operator (NSO) noted that the Temporary Lift on the out-of-service for valve 2EH-5049B was due to expire on that day. The NSO delivered the Temporary Lift paperwork to a licensed senior reactor operator Shift Control Room Engineer (SCRE) to obtain a decision as to whether the Temporary Lift should be extended or terminated by restoring the out-of-service. The SCRE returned the Temporary Lift paperwork to the NSO and directed him to terminate the Temporary Lift by returning the equipment to an out-of-service condition. Both the SCRE and the NSO believed that the out-of-service would only affect 2EH-5049B by closing 2EH-5058B, however, in actuality the closing of 2EH-5058B also isolates fluid to the High Pressure Governor Valve which was supplying steam to the 2C MFP turbine at the time. The NSO directed an equipment operator (EO) to restore the out-of-service.

At 1214 on May 6, 1988, with Unit 2 at 94 percent power, the EO closed 2EH-5058B as instructed. Shortly thereafter the "Feedwater Pump Turbine Oil Pressure Low" annunciator actuated in the Control Room. This annunciator alarms due to either low lubricating oil pressure or low electrohydraulic (EH) fluid pressure. The NSO contacted the EO by radio immediately to notify him of the alarming condition. Simultaneously the EO heard the 2C MFP turbine speed decreasing and tried to open 2EH-5058B.

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B. DESCRIPTION OF EVENT: (Continued)

At 1215 the "Feedwater Pump 2C Trip" annunciator actuated. The NSO initiated a preset main turbine (TB) runback to 559 Megawatts-electric (MWe) at 175 MWe/minute. At 1216 narrow range levels in all steam generators (S/G's) had decreased to the low alarm setpoint. The SCRE selected manual governor valve fast action to more rapidly runback the main turbine because the preset runback did not seem to be operating as expected. Narrow range levels in all S/G's continued to decrease. The SCRE directed the NSO to manually trip the reactor when narrow range S/G levels dropped to 20 percent. At 1216 the NSO manually tripped the reactor and an automatic turbine trip followed. The Control Room operators entered and complied with "Reactor Trip or Safety Injection Unit 2 Emergency Procedure" (2BEP-0). The 2A and 2B Auxiliary Feedwater Pumps (AFP's) (BA) automatically started due to the low low S/G levels

resulting from the feedwater-steam flow mismatch and indicated level shrink on the trip. At 1217 a Feedwater Isolation occurred due to the expected decrease in Average Reactor Coolant Temperature (Tavg) to its low setpoint coincident with the reactor trip. The 2C S/G Power Operated Relief Valve (PORV) opened fully and remained open until the NSO placed its controller in manual and fully closed it at 1219.

At 1245 the Feedwater Isolation signal was reset, the Startup Feedwater pump was started, and a flow path from the Startup Feedwater pump to the S/G's was established. At 1308 the 2B AFP was stopped and at 1323 the 2A AFP was stopped. Stable plant conditions were achieved at 1330 with Unit 2 in Hot Standby (Mode 3). Operator actions taken following the reactor trip were correct and contributed to the safe conclusion of the event.

This event is reportable in accordance with 10CFR50.73(a)(2)(iv) due to the manual actuation of the Reactor Protection System.

C. CAUSE OF EVENT:

The cause of the reactor trip was the manual actuation of the reactor trip switch on the main control board by the NSO. The NSO manually actuated the trip due to downward trending low narrow range S/G levels in anticipation of an automatic reactor trip. The low narrow range S/G levels were caused by the tripping of the 2C MFP while the plant was at 94 percent power, which resulted in a steam flow-feed flow mismatch. Contributing to the low levels was indicated level shrink caused by the operator initiated main turbine runback. The 2C MFP trip was caused by the EO when he closed 2EH-5058B, which isolated the EH control fluid supply from the High Pressure Governor Valve. This caused the governor valve to close and block all steam flow to the 2C MFP turbine. The cause for the improper opening of the 2C PORV was not determined after extensive troubleshooting by Maintenance department technicians, and the valve was declared operable on May 11, 1988. The main turbine runback was determined to have been responding properly to the event.

Several causes contributed to the improper closure of 2EH-5058B. The licensed NSO and SCRE committed cognitive personnel errors by failing to recognize the consequences of the return to out-of-service condition. The NSO and SCRE directed the operation of plant equipment without fully understanding the impact of that operation. Both individuals believed that the closing of valve 2EH-5058B would only isolate the EH fluid supply from the Low Pressure Governor Valve, and that the High Pressure Governor Valve would remain unaffected and permit uninterrupted operation of the 2C MFP. Their belief was based on an incorrect assumption that

the affected portion of the MFP EH system is designed similarly to the Main Turbine EH system where individual EH isolation valves are provided for each governor valve. Neither operator consulted piping system drawings to verify that the return to out-of-service could be performed without seriously impacting plant operation. There were no unusual characteristics of the plant environment that contributed to the personnel errors.

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C. CAUSE OF EVENT: (Continued)

Byron Administrative Procedure "Administrative Requirements for Temporarily Lifting OOS Cards and/or Placing Equipment in Test" (BAP 331-1) provides direction and responsibility for the initiation and termination of Temporary Lifts. It does not require licensed senior reactor operator (SRO) involvement for the termination of a Temporary Lift. Although the NSO involved the SCRE during this event, the SCRE still was not required to document his approval of the proposed action. Additionally BAP 331-1 does not require a thorough review of the effects that a return to out-of-service condition may have on operating plant equipment, as would be required for the initial out-of-service per "Station Equipment Out-of-Service Procedure" (BAP 330-1).

D. SAFETY ANALYSIS:

Neither plant safety nor public safety were affected by this event. All Engineered Safety Feature (ESF) systems operated properly to minimize the consequences of the plant trip. Although the 2C S/G PORV opened and remained open until placed in manual and closed, this caused only a minor Reactor Coolant System cooldown to approximately 551 degrees F and briefly delayed the achievement of stable plant conditions. The more severe condition of a MFP trip at 100% reactor power would only have accelerated the pace of events, and plant/public safety would have remained unaffected.

E. CORRECTIVE ACTIONS:

In order to permit continued operation of the 2C MFP using the High Pressure Governor Valve, an Onsite Review was completed to clear the out-of-service that required the closing of 2EH-5058B. This action eliminated the need to operate the 2C MFP with a temporary lift condition in effect.

The 2C S/G PORV was initially isolated by closing its manual isolation

valve, and the associated Technical Specification Limiting Condition for Operation Action Requirement was satisfied. When troubleshooting efforts failed to identify any component failures, valve operability was verified and the valve was declared operable at 1212 on May 11, 1988.

The Operating Department personnel involved in the event have been interviewed and specific performance weaknesses have been discussed.

The BAP 331-1 will be revised to include:

1. SRO responsibility for the termination of Temporary Lifts.
2. A caution statement to ensure the conduct of a thorough technical review prior to returning temporarily lifted equipment to an out-of-service condition.

The "Operating Shift Turnover and Relief Administrative Procedure" (BAP 335-1) will be revised to require Shift Engineer (licensed SRO) review of Temporary Lift packages each shift. Completion of the procedure revisions is tracked by Action Item Record 454-225-88-0117.

Management review of Temporary Lifts has been increased. A listing of all Temporary Lifts is presented to the Operating Engineers for their review and disposition.

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F. PREVIOUS OCCURRENCES:

NONE

G. COMPONENT FAILURE DATA:

Not Applicable

ATTACHMENT # 1 TO ANO # 8808030045 PAGE: 1 of 1

Commonwealth Edison
Byron Nuclear Station
4450 North German Church Road
Byron, Illinois 61010

July 22, 1988

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report from Byron Generating Station is being transmitted to you as a supplemental report.

This report is number 88-004-01; Docket No. 50-455.

Sincerely,

/s/

R. Pleniewicz

Station Manager

Byron Nuclear Power Station

Enclosure: Licensee Event Report No. 88-004-01

cc: A. Bert Davis, NRC Region III Administrator

P. Brochman, NRC Senior Resident Inspector

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